

# SPECTRUM

RESEARCH AT THE UNIVERSITY OF ALBERTA

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## The tremendous force of the baby boomers

*Some myths are also put to rest*

**I**f there's one subject history professor Doug Owsram is qualified to write about, it's the baby boom. Not only does this generation (from about 1947 to 1962) fit right in with his speciality of cultural history, Dr Owsram also has valuable first-hand experience—he's a boomer himself.

"The baby boom has been an overwhelming force in modern society," says Dr Owsram. "One of the main reasons is the sheer size of the generation. It was an explosion of children—in the 1950s there were 400,000 births per year in Canada. It created a whole new consumer market. The baby boom shaped the social, educational, political and cultural climate of the ensuing decades."

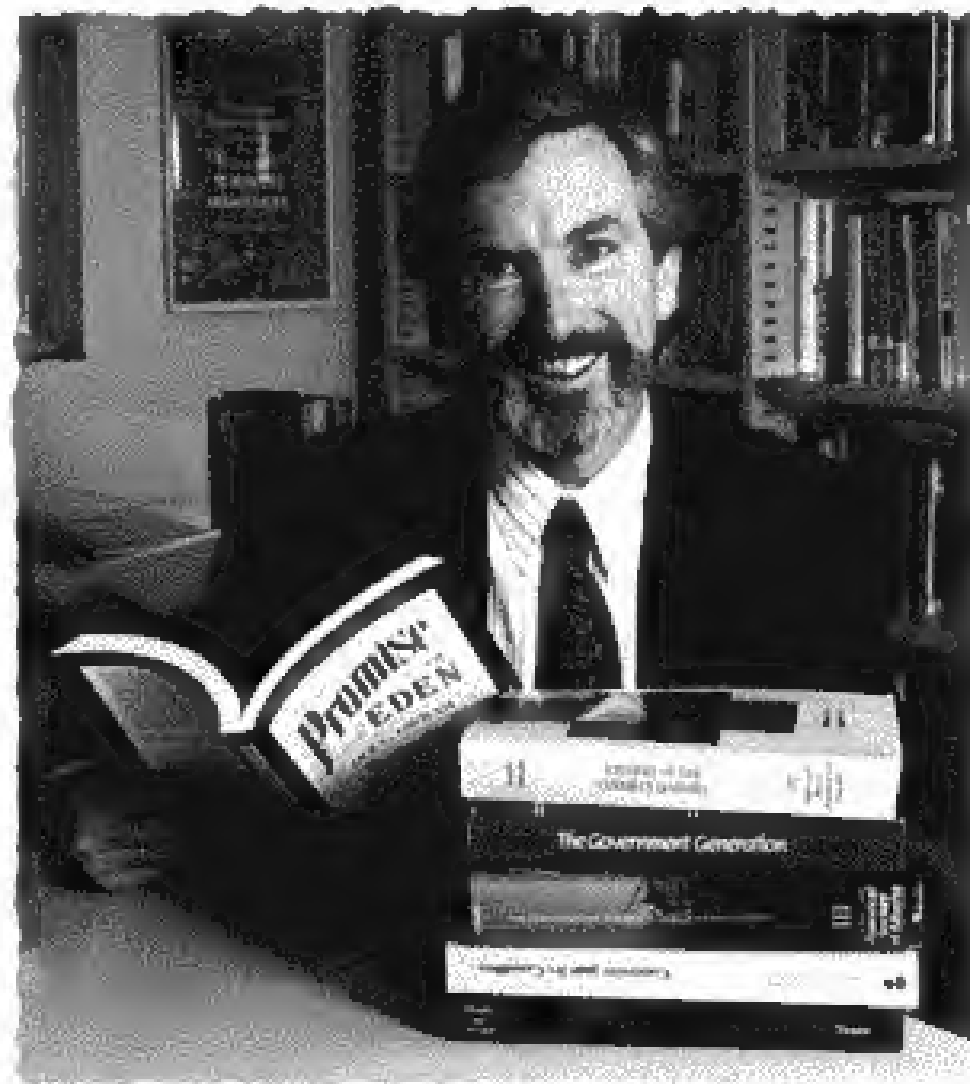
While others have chronicled the economic effects of the baby boom, Dr Owsram is the first to write a social and cultural history of this generation in Canada. (The book should be published

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"Boomers have an overwhelming sense of themselves as unique... parents of baby boomers have been much maligned."  
.....

next year.) Rather than organizing around traditional historical themes such as class or ethnicity, the book takes a generational approach.

"I can do this because the baby boom is enough of a distinct culture," explains Dr Owsram. "The period from the mid-'40s to the early '60s was a cultural anomaly. Divorce rates fell, the number of working women fell, huge numbers of people moved to the suburbs."

Because Dr Owsram is tracking a generation, the nature of the evidence he uses changes with time. For the early years of the baby boom, he relies on sources such as baby care books and *Chatelaine*



A baby boomer himself, Doug Owsram says personal reminiscence is included in this history of his generation.

magazine. When boomers hit the school system, Dr Owsram follows them with school curricula and transcripts of public debates on education. For the 1960s counterculture, underground newspapers have been a mine of information. As well as the paper record, Dr Owsram is also reviewing music, films and television.

"There's a certain amount of personal reminiscence involved in this work," adds Dr Owsram. "However, I'm finding that when I go back as a historian and see things from a different angle, they often didn't happen quite the way I remember."

One of Dr Owsram's reasons for tackling a history of the baby boom is to put to rest

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## Thin films

*But they're not diet movies*

**T**o describe the problems of working with thin films, electrical engineering professor Michael Brett cites an example from his PhD research. He was experimenting with window coatings using zinc oxide. The first time he tried it, the coating turned black — not much use for windows.

Fortunately, Dr Brett's technique has improved considerably since then. Now, if there's a need for a thin film on campus, he is likely to be involved in its development. Projects currently under way in his lab include thin films for a sulfur oxide gas sensor, a radio wave receiver and the kind of computer chip used in telecommunication switches.

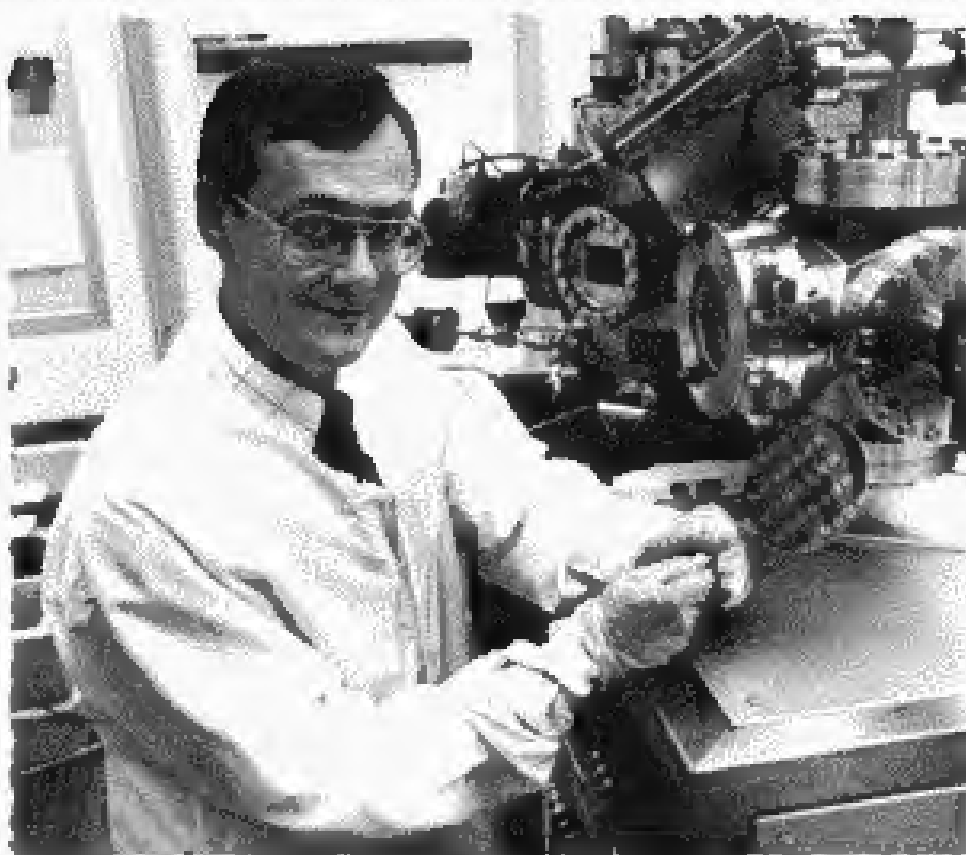
"I like the breadth of the applications of thin films—window coatings, computer chips, testiles, anticounterfeit coatings on \$20 bills. I've even worked with a meteorologist on hailstone growth," Dr Brett says. "I wouldn't want to be in a narrow field."

Thin films—measuring less than the diameter of a human hair—are used to coat materials to give them a particular property such as hardness. The films must be precise in their thickness and composition or they won't do what they're supposed to do.

"The trick is that thin films are never like the bulk material," says Dr Brett. "They are difficult to optimize for the property you want. Small flaws can gang up to ruin a film."

Thin films are also the building blocks of microelectronic devices. Computer chips consist of multiple layers of thin films that are etched in specific patterns. Those patterns, and the thin film material itself, determine what a chip can do.

The precision required to apply thin films can make chip making a very expensive and time-consuming venture. Dr Brett has developed computer



Michael Brett's research has included designing forgery-proof coatings for \$20 bills and examining hailstones.

simulation software, SIMBAD™, that models the growth of thin films. Using the simulator to test chip design before a chip is made can save a considerable amount of money. The SIMBAD™ package is being marketed by the Alberta Microelectronic Centre (AMC).

Dr Brett's association with AMC began when he arrived at the University in 1986. The Centre, established in 1982 as a nonprofit corporation to assist companies with the application of microelectronics technology, was also a relative newcomer to campus.

"AMC's capabilities and my research grew together," says Dr Brett. "It's only because of AMC that I can undertake many of these projects. The Centre has the state-of-the-art equipment for making thin films. If we had 30-year-old equipment, few companies would be interested in us. AMC is also a natural partner for commercialization of products like SIMBAD™ that come out of university research. It's an arrangement that works well."

The SIMBAD™ project is supported by the Natural Sciences and Engineering Research Council, the Microelet Centre of Excellence, the Alberta Microelectronic Centre and industry sponsors. □

## Boomers

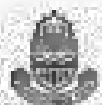
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some of the myths about the generation. One of those myths concerns the uniqueness of baby boomers. Dr Owsram argues that although the generation has some special characteristics, it is not unique.

"Boomers have an overwhelming sense of themselves as unique," he says. "That translates into self-confidence on the positive side and arrogance on the negative side."

"Parents of baby boomers have been much maligned. It's easy to gloss over their contribution and yet they provided the material base for the baby boom. Moral superiority of one generation over the previous one is false. When you do this research you see a particular rhythm to the generations because of demographic and social trends. For example, the dominant baby boom was followed by a recessive generation—the baby busters or Generation X. Boomers should start seeing themselves as part of history rather than apart from it."

Dr Owsram receives funding from the Social Sciences and Humanities Research Council. □



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# Controlling our own lives

*Are our wishes respected?*

**W**hen Sue Rodriguez petitioned the courts to allow her to commit assisted suicide, she forced Canada's judicial system to tackle the issue of how much control people have over their own lives. Could Rodriguez—who suffers from Lou Gehrig's Disease, a progressive, debilitating illness—decide when and where she wanted to die? The Supreme Court said no. Although euthanasia is a criminal matter and therefore under federal jurisdiction, personal control is also an issue on the provincial level as it relates to lives governing the decisions people make about their finances and medical treatment.

"Issues of personal control challenge us to consider and reassess fundamental values," says law professor Gerald Robertson. "We're talking about the power of the individual to exercise autonomy over their own decisions. The law must strike a balance between individual interests and those of society."

Professor Robertson has explored the issue of personal control in two projects done for the Alberta Law Reform Institute. The purpose of this research is to recommend

the creation of new legislation or changes to existing legislation.

The first project covered enduring powers of attorney. The final report recommended that Alberta enact legislation to allow an individual to plan for incapacity by naming someone to look after their affairs when they become incapable of doing so. Such a system avoids the need to go to court and have a trustee appointed.

"The purpose of this legislation is to make the process of appointing someone to look after your affairs informal and straightforward," explains Professor Robertson. "But because it involves handing over control to someone else, there is potential for abuse. So the legislation must also contain safeguards to protect, for example, a person from signing a powers of attorney form without knowing what it is. In Alberta, a person must go to a lawyer to sign the document."

The second project extended the concept of personal control over decision-making into the area of health care. It concerned advance directives or living



*Legislation covering living wills is expected next spring as a result of Gerald Robertson's research on issues of personal control.*

wills, as they are more commonly known. In a living will, a person specifies what kind of medical treatment they want and do not want. It applies when the person is unconscious or otherwise mentally incapable of expressing their wishes. In his report, Professor Robertson recommended that if such directives are relevant and unambiguous, they must be followed. He also recommended that people be allowed to appoint an agent to make health care decisions for them and that this appointment have the force of law.

"For the most part, the recommendations reflect what's done in practice," says Professor Robertson. "However they are not yet recognized in the law."

"The interest in legalizing living wills is being driven by fear. People fear that, when they reach the end stage, they will be subjected to inappropriate medical procedures. They worry they won't be able to say no. The purpose of the proposed legislation is to give as much control over medical treatment to individuals in advance. They can take comfort in the knowledge that their wishes will be respected."

The Powers of Attorney Act was passed in the Alberta Legislature in June 1991. Professor Robertson expects that legislation covering living wills will be enacted sometime next spring.

Both the powers of attorney and advance directives projects were funded by the Alberta Law Foundation.

# A new kind of database collects 'objects'

*A test project is in the works*

**T**amer Özsu's interest in database research began with the telephone. In the mid-'70s, the computing science professor was working for the Turkish telephone company on computerizing its directory assistance system. At the same time, he was completing a Master's degree in industrial engineering. One of his courses was on databases—a hot new area of computer science. "The light went on," he recalls. "I saw that databases were the solution to the problems we were encountering with directory assistance."

Twenty years later, databases are the key technology for storing and using the vast amounts of data stored on computers. The state-of-the-art in commercial databases is relational database technology, now a multibillion dollar industry.

Relational databases are very good at representing "flat" data—that is, data such as telephone numbers and employment statistics that can easily be put in tables. However, they have proven much less successful with data that does not lend



*For commercial success, a database system must both work efficiently and be easy to use, says Tamer Özsu.*

itself to being put in tables. Examples are geographic data, medical images such as CAT scans, and engineering design drawings.

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## Database

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"These objects are not flat so it's very difficult to represent them in tables," explains Dr Özsü. "For the past five years I've been working on a new technology called object-oriented database management systems. This software represents objects as are they are in the real world." The result is a database that is not a collection of tables representing real-life entities, but rather a collection of objects that more directly represents those entities.

Dr Özsü's research team has developed a prototype object-oriented database and they are now attempting to improve its efficiency. The challenge in this work is to make the system as efficient as possible while at the same time making it as easy as possible for users to access and manipulate data.

"It's not easy to do both," says Dr Özsü. "A system may be easy to use but if it works like a dog, it's really no good. Commercial success will be based on doing both."

Dr Özsü notes that although object-oriented databases have been touted as the future of databases, very few applications have actually been built. He is eager to put the claims to a test and is now getting the opportunity as part of a multimedia data management project funded by the Canadian Institute for Telecommunications Research, one of the federal networks of centres of excellence.

The target application is multimedia news where users receive text, images and sound at their computer. The research team will be using object-oriented databases to do this.

"Databases are enabling technologies," says Dr Özsü. "They're totally useless unless you can build applications. However, investment is high in the current technology and developers are therefore reluctant to look at new technology. We need to build applications to see what object-oriented databases can do more efficiently. I've always wanted to work on an application to stress test the technology, but such a project is beyond the scope of one researcher. It requires many people and substantial funding. We've finally been able to put it together."

Dr Özsü's research is supported by the Natural Sciences and Engineering Research Council and the Canadian Institute for Telecommunications Research. □

## Muscle loss, muscle gain

*What's really happening?*

**T**he picture, by now, is a familiar one: shrunken body, hollow eyes, skin hanging from the arms. A victim of famine in a third world country? Not necessarily. Muscle wasting is not limited to starving people in poor countries. It can happen as the result of disease or injury to anyone, anywhere.

"When you get sick one of the first consequences is to limit eating," explains animal science professor Vickie Baracos. "This can result in a cycle of disease which causes malnutrition which in turn makes the disease more serious."

"At the end of a bout of cancer, a patient can lose 75 per cent of the muscles they had in the first place. That's a disaster."

Muscle wasting is the body's attempt at reorganization to meet its nutritional requirements. When food intake is restricted, the body breaks down muscle tissue and channels the protein to the defence systems. But this can only go on to a certain point. Eventually the reserves get so low it becomes very difficult to fight the disease or, in the case of cancer patients, survive the therapy.

Attempts to reverse the process of muscle wasting have focused on giving patients more food. For the most part, this approach hasn't worked. "I believe that the reason these treatments haven't been

successful is because the underlying process of muscle wasting is very complex and not fully understood," says Dr Baracos. "We must first understand what's going on and use this knowledge to design treatments."

During muscle wasting, the muscles receive signals that tell them to break down and redirect protein. While hormones have a part in switching this process on, it's now known that they are not the only signals. Dr Baracos has worked on the cells of the immune system, studying the factors they produce and the role they play in muscle wasting. One of most surprising findings from this research was that the cells of the immune system communicate with fat and muscle tissue and instruct them to break down.

While continuing her work on muscle degradation, Dr Baracos has recently become interested in a much different process experienced by people who are recovering from wasting. It is a type of super growth, called catch-up growth, which allows patients to return quickly to the state they were in before they got sick.

"Catch-up growth is growth at an extraordinary rate with extraordinary efficiency," explains Dr Baracos. "If we could figure out what drives this growth, we could apply all the elements of that state to individuals suffering from wasting."

Dr Baracos says it was perversity that got her into research on muscle wasting. "When I was a student and told my professor that I wanted to get into this area, he said I was nuts to try. He said that not enough was known to piece together a picture, that the area was a nightmare, technically and conceptually."

"That was 15 years ago. Now, although there's still a lot we don't know, we've made quite a bit of progress. For example, a new degradative system has been discovered that appears to explain the destruction of tissue in these wasted states. Industry is now working on drugs to disable the degradative systems. This is an indication that we're getting close to understanding muscle wasting."

Dr Baracos receives funding from the Natural Sciences and Engineering Research Council, the American Institute for Cancer Research, the Canadian Diabetes Association and the Alberta Agriculture Research Institute. □



"My professor said I was nuts to get into research on muscle wasting," Vickie Baracos remembers.

## Move it!

*Fat kids find that hard to do*

**B**eyond the playground taunts of "fatso" and "pudge" are some serious research questions about childhood obesity. Are fat kids overweight simply because they don't get enough exercise? Why is obesity on the rise in children, particularly in girls? Which physical activity programs work best for obese children?

These are the kinds of questions that fascinate physical education professor Dru Marshall. "We say we should prevent obesity from happening," she says. "But 95 per cent of treatment programs for obesity in adults are unsuccessful. Should we put kids in a cycle of failure at such a young age? There's so much we don't know and should find out."

One thing we do know is that obesity is on the increase in children, at least in Edmonton. (Obesity is defined as having



*Before they can be successful at exercising, fat children need to be taught to move. Dru Marshall's research shows.*

an excess amount of body fat that causes a significant health risk.) In 1991, Dr Marshall headed a multidisciplinary team that surveyed 600 Edmonton public school children to determine levels of obesity. The results were compared with a similar study done in 1981. In the earlier study, 19.5 per

cent of boys were found to be obese; in 1991, 23.5 per cent of boys were obese—a 19 per cent increase. For girls, the obesity measure jumped from 14.7 per cent in 1981 to 24.4 per cent in 1991—a stunning 66 per cent increase.

The 1991 study has provided an enormous amount of data on childhood obesity, data that Dr Marshall is now using in a variety of research projects. One finding that she is eager to investigate more closely is the difference in obesity rates between the sexes.

"I'm interested in why the obesity rate increased so dramatically among girls," she says. "Is it that girls don't have the same opportunity for activity as boys, or are they not encouraged to be as physically active? Much has been written about the trouble girls have with math and science as they reach the higher grades. I wonder whether the same thing may be happening in physical education classes."

Dr Marshall is also looking at the effectiveness of the standard treatment for obesity—a combination of behavior modification, diet and exercise. The typical exercise component is geared to increasing fitness. Dr Marshall and physical education professor Marcel Bouffard have hypothesized that the reason obese kids have difficulty with fitness programs is because they have "movement incompetencies". Simply put, fat kids don't move well.

Preliminary results from a pilot study of children in Grades 1 and 4 indicate that the researchers are on the right track. The movement competency of obese children improved markedly in schools that had a quality daily physical education (QDPE) program. (In a QDPE program, a specific amount of physical education instruction is given every day, and is taught by a teacher with physical education training.)

"This finding—it needs to be replicated—indicates that instead of fitness classes obese children should be getting motor skill classes in which they're taught how to move," explains Dr Marshall.

"The skills will help them be successful in other physical activities so they'll be more likely to participate in them. This is the most rewarding and exciting part of the research—seeing that it will have an impact on how physical activity programs are developed for obese children."

Support for Dr Marshall's research comes from the Northern Alberta Children's Hospital Foundation, the National Health Research Development Program and the Canadian Fitness and Lifestyle Research Institute. □

## It's a sleuth's game

*Solving a geological whodunit*

**W**hile out doing field work for his PhD in geology, Roger Morton met a farmer. Asked what he was doing, Dr Morton recalls that he gave an "erudite explanation of my research. I went on about the well-being of the world and other grand concepts." The farmer listened politely and when Dr Morton was finished, commented, "And what does your mother think of all this?"

It was the kind of reality check that Dr Morton says was lost on him until he left Britain and came to Canada in 1966. "Until then I was a myopic scientist. I had both feet in the ivory tower. But when I came to this country I realized I couldn't operate as an economic geologist in an isolated fashion. I had to work with industry. Now I keep one foot firmly planted outside the ivory tower."

Dr Morton does basic research that can be applied by industry to aid in the search for and discovery of new mineral resources. He likens the work of economic geologists to solving a geological whodunit. "What we do in economic geology is retrace the events and processes that led to the formation of ore deposits," Dr Morton explains. "You can't afford to ignore any kind of evidence—chemical, physical or observations in the field."

Dr Morton believes that industrial experience is not only a key to success in



*As traditional jobs in geology disappear, Roger Morton advocates entrepreneurship as an alternative career path.*

economic geology, it is also vital to the effective teaching of the subject. "I'm a dedicated teacher," he says. "I believe it's my duty to bring a clear understanding to the classroom of what it's like out there in the real world, before my students are thrown into it. By working with industry, I am able to teach with a lot more insight into industrial and governmental attitudes on an international basis."

As traditional jobs in geology become scarcer and scarcer, one of the career paths

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# Solutions to a shocking problem

*The challenge is to pick the right one*



For Bryant Moodie, research is especially rewarding when he can apply basic knowledge to real-life problems.

**T**he flow of air over an airplane wing, flood waves in rivers or traffic movement along a highway—it seems that mathematicians can describe just about anything with an equation. But into even a mathematician's ordered world a little chaos must fall.

"No matter how nice and behaved these systems are, their solutions develop shocks," explains mathematics professor Bryant Moodie. "These shocks don't satisfy the governing equations. You have to come up with other equations to describe them."

And that's not easy. Shocks, known more technically as propagating discontinuities, can be studied using a special methodology called Rankine-Hugoniot conditions. However, this method does not result in a unique solution to the problem. Instead, it generates a number of possible solutions as functions of space and time. "The challenge is to pick out which solution is the correct one," says Dr. Moodie.

While this may sound like an esoteric pursuit to the uninitiated, solving these equations has some very practical and wide-ranging implications. For example, it is important to know how shock waves propagate, grow and die out when designing aircraft, planning natural gas pipelines and even when forecasting the weather because weather fronts are actually shock waves.

Dr. Moodie is studying the underlying structure of the nonlinear equations used to describe shock waves. Attracted by the

challenging problems presented by these equations, he began working in this area three years ago. He started by giving graduate seminars on the topic every Friday afternoon. It was a stressful but

effective way to learn the new material quickly.

"The hardest part is keeping up with the literature and learning new tools, because they are different from the tools I was using in my other research," Dr. Moodie says.

"This field is highly competitive; that's really what I enjoy most. I like competing with other people. The leading researchers are at Stanford, MIT and Princeton. They referee my papers, they accept them."

Although his work to date has been primarily basic research, Dr. Moodie is interested in applications, particularly geophysics applications such as atmospheric dynamics. (Dr. Moodie is director of the University's Applied Mathematics Institute, which is home to the *Canadian Applied Mathematics Quarterly*.)

"To apply math, you have to know a fair bit about the applied area," he says. "In many cases learning the application can be as onerous as the math itself. But for me, it's the application of basic knowledge to real-world problems that makes the research especially rewarding."

Support for Dr. Moodie's research comes from the Natural Sciences and Engineering Research Council, the Killam Foundation and the Central Research Fund.

## Nineteenth-century issues of the body

*Feminists are still working through them*

**W**hen popular books and articles refer to feminism as a movement with its roots in the 1960s, they're missing at least some of the point. The feminist movement that began in the '60s is actually the second wave of feminism, the first took place in the 1800s.

"Sometimes it seems as if there's no history to the second wave of feminism," says English professor Jo-Ann Wallace. "But in fact there is a long and important history. This is one of the things I want to remind people."

Dr. Wallace is putting these reminders in a book she is writing, *Feminist Theories of the Body*. In it, she explores three social or political struggles of the 1800s, the implications of which modern-day feminists are still working through.

The first involves a question of race: the issue is the abolition of slavery in the United States. Many women organized around this cause, drawing parallels

between the treatment of slaves and the treatment of women.

The second issue is one of class—the organization of middle-class women in England to have the Contagious Diseases Acts repealed. Under these acts, any woman suspected of prostitution could be confined and forcibly examined for venereal diseases. The act was aimed at working class women and native women in colonial outposts; the middle class women who protested against the act argued on their behalf.

Dr. Wallace's third example involves the work of sociologists on sexual identity and deviance. Researchers such as Havelock Ellis and Edward Carpenter gave lesbian women a language to articulate their sexuality. Feminists used this work to argue for acceptance and recognition.

"These three issues are issues of the body," explains Dr. Wallace. "The first two deal with ownership of the body, the third

# The researcher-physician

*One hand in research, one hand on the patient*

**D**r Philip Halloran is an addict and one of his missions is to encourage other doctors to take up the same addiction. But before this conjures up images of an immunology professor pushing illicit drugs, it's important to point out that Dr Halloran's addiction is to research. His mission is to encourage more doctors to become clinician scientists, a rare breed of physician who undertakes research and treats patients.

"Our goal is to shorten the time required to take what's going on in science and apply it to patients," explains Dr Halloran. "There's a gap between basic science and clinical science so that clinical science lags behind. Clinician scientists can bridge that gap. These people are scientists in their own right and yet they can see the applicability of advances in basic science to the bedside. It takes an unusual person to do this, they're a rare breed."

Dr Halloran is one of those unusual people. He began his medical career in internal medicine specializing in nephrology (the branch of medicine concerned with the kidneys) and soon became interested in why grafts were rejected and how the drugs that prevent rejection work. Those questions led him to a PhD; he now heads the University's Clinical Molecular Immunology Group. His team is using molecular immunology to improve the understanding and treatment of transplant recipients and patients with

inflammatory diseases.

One of the recent successes of the group involves research on cyclosporin, a drug which suppresses the body's immune system and is commonly used to prevent rejection in transplant recipients. Building on basic research done at the University, which demonstrated how cyclosporin works in the test tube, the team was able to demonstrate how the drug works in people. The finding will allow physicians to monitor the actual immunosuppressive effect of cyclosporin, not simply the level of the drug in a person's body.

"We've come up with a system that tells us how much immune suppression we will get when treating patients with cyclosporin," explains Dr Halloran. "It's not a black box any more. Consequently we can find out how much drug is needed for success and how much will result in complications. Doctors can prescribe the drug within that 'window'. This is an example of taking basic research and finding a direct application to patients."

The research results can also be applied to drug testing because there is now an objective method to evaluate the effect of drugs. Dr Halloran's dream is to establish a centre for this kind of evaluation and development and he is trying to attract industry support for the project. Negotiations are under way with at least five companies.



*Patients benefit most from advances in knowledge when physicians are also researchers, says Philip Halloran.*

"What we're doing will benefit people, bring health care costs down and bring investment to Alberta," says Dr Halloran. "It's relatively easy to get an investment from industry of hundreds of thousands of dollars; millions of dollars is much more difficult and that's what we're after. But they can't hang you for trying."

Funding for research done by the Clinical Molecular Immunology Group comes from the Medical Research Council, Alberta Heritage Foundation for Medical Research, the Kidney Foundation, the Canadian Legion, the Muttart Foundation, Sandoz Pharmaceuticals and Syntex Corp...

deals with the right to define one's own sexuality. Nineteenth century feminists took these up as issues. In the twentieth century, we're still working through them, though with a greater understanding of the problems, but also sometimes with the necessity of speaking on behalf of other women."

The difference now is that there's more of an academic focus to the work. Feminist scholars have developed a detailed body of knowledge, drawing on related themes in areas such as psychoanalysis, linguistics and Marxism.

"Only now do we understand how deeply rooted sexism and racism are," says Dr Wallace. "Theory helps us understand the investment that individuals and institutions have in covert racism and sexism."

"Women in the nineteenth century thought that if women could get the vote, there would be a social revolution. There

has been progress, but not the utopian future they imagined. Theory allows us to see that we all have a role in keeping things the ways they are."

But theory can only go so far. Dr Wallace believes that the second wave of feminism has to recapture some of the social activism of the first wave. Without a sense of political passion, she says, theory can become nihilistic or cynical.

"I say we have to go back to social activism, to use theory and turn it on social issues again. Now that we've developed this highly sophisticated, theoretical knowledge, we must find material things to do with it."

"Theory must connect with social issues. The issues will fine-tune the theory and the theory can be used to inform social issues. The two must come together."

Dr Wallace's research is supported by the Social Sciences and Humanities Research Council...



*Today's feminist movement needs to recapture some of the social activism of nineteenth-century feminism, Dr Ann Wallace believes.*

## When toothache won't stop

*What causes it? What will cure it?*



Through his research on nerve damage and nerve repair, Rex Holland hopes to help people who suffer chronic tooth-ache pain.

**T**he prospect of a toothache can strike fear into even the bravest of souls. Fortunately, most toothaches can be remedied by an emergency trip to the dentist. However, for some very unlucky patients, tooth pain goes on and on without relief.

"Acute pain is useful," says dentistry professor Rex Holland. "For example, if

you lurch a hot object, you'll take your hand away quickly. But chronic pain is different because it has no value. It is a disease."

Dr Holland's research is on chronic pain associated with damage to the nerves supplying the teeth and tongue. Nerve damage can be caused by such things as trauma, tumors and—most commonly—

tooth extraction, particularly impacted wisdom teeth. (About five per cent of people who have their wisdom teeth extracted suffer nerve damage.) But by no means all patients who have nerve damage suffer chronic pain.

"So there must be other factors involved in chronic oro-facial pain or it would be experienced almost universally," says Dr Holland. "Chances are, there are multiple causes. I'm interested in finding out what those secondary factors are."

One factor that Dr Holland has investigated is inflammation. It may be that inflamed tissue makes the nerves grow in a confused manner, instead of growing straight and insulated from each other. The resulting knotted, tangled mass is called a neuroma. One hypothesis on why some neuromas are painful is that there is 'cross talk' among nerves—a signal travelling along one nerve may excite a pain fibre by mistake.

Nerve damage is only part of Dr Holland's research program. He also works on its cure—nerve repair. While some nerves recover well after damage, the nerve that supplies the tongue (the lingual nerve) does not. And although many methods of nerve repair have been developed, they aren't necessarily successful when applied to repairing the lingual nerve. Dr Holland, in collaboration with oral surgeons Peter Robertson and Keith Smith from the University of Sheffield, is studying the effectiveness of various repair methods on lingual nerve damage. So far, they have looked at suturing nerves together and using a polyethylene tube to make them grow together. Next year, they will study grafting procedures.

"We need to have this kind of specific information in order to truly help patients," says Dr Holland. "That's the value of research."

Dr Holland's interest in research began when he was an undergraduate at the University of Bristol. Although enrolled in the dentistry school, he qualified for a unique program which allowed him to do a science degree at the same time. It also afforded an opportunity to work in a dental research lab. Upon graduation from dental school, Dr Holland went on to do a PhD.

"I was 'infected' by the people at Bristol, they turned me on to research," he says. "There's real excitement in getting the data from experiments and seeing where they fit in, how they add another step to the argument."

Dr. Holland's research is supported by the Medical Research Council. He has also received an establishment grant from the Alberta Heritage Foundation for Medical Research.

## Sleuth

*Continued from page 5*

Dr Morton has been advocating to his students is entrepreneurship. In 1984 he decided to take his own advice. The opportunity was the development of a gold mine in Guyana.

"It seemed to me that this was an ideal opportunity for foreign investment," says Dr Morton. "The deposit had been looked at in the 1940s but was not considered economically feasible to mine by underground methods. But now open pit technology can get the gold out more efficiently so that mining there makes economic sense."

That was the beginning of Golden Star Resources Ltd, an Alberta company that Dr Morton helped found. GSR's Ormai mine in Guyana is now the largest gold mine in South America, producing over \$100-million of gold per year.

But Dr Morton isn't staking his reputation on gold alone. The "diamond rush" in Alberta has recently captured his interest. "With economic geology, you have to swing with the wind," Dr Morton says. "There's no point in specializing in only one commodity. If prices are low for that mineral, no one's going to go looking for it and you'll be out of a job."

"The time from the day of discovery to the opening of a mine is about 10 to 15 years. I expect diamonds will take me to retirement."